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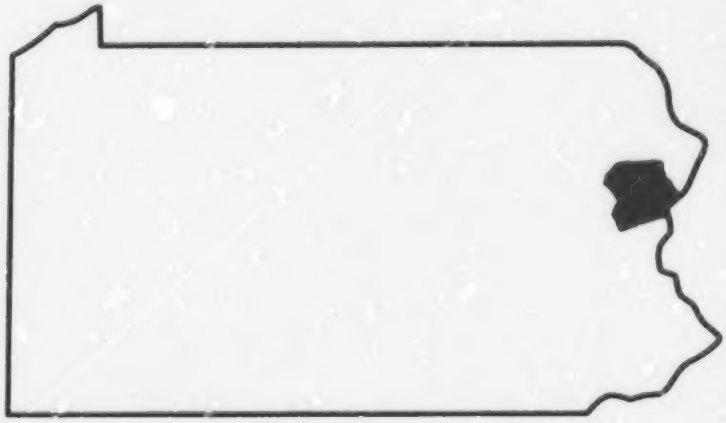
FLOOD INSURANCE STUDY

TOWNSHIP OF COOLBAUGH, PENNSYLVANIA
MONROE COUNTY



NOVEMBER 4, 1988

COMPLETED

Federal Emergency Management Agency

COMMUNITY NUMBER - 421886

ORIGINAL

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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III

FLOOD INSURANCE STUDY
TOWNSHIP OF COOLBAUGH, MONROE COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Coolbaugh, Monroe County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Philadelphia District of the U. S. Army Corps of Engineers (COE) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1822, Project Order No. 1, Amendment No. 16. This work was completed in December 1986.

1.3 Coordination

In December 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA and the County Planning Office to determine the streams to be studied by detailed methods. A search for basic data was made at all levels of government. A map was supplied by community officials and topographic maps were obtained from the U. S. Geological Survey (USGS).

On November 19, 1987, a final CCO meeting was held with representatives of FEMA, the township, and the COE (the study contractor) to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Coolbaugh, Monroe County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: Tobyhanna Creek, from Interstate Route 380 to a point approximately 1,100 feet upstream of Leonard Lane; and the Lehigh River, from a point approximately 1,320 feet upstream of the confluence of Choke Creek to a point approximately 0.8 mile upstream of the confluence of Wolf Run. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through December 1991.

Portions or all of the following flooding sources were studied by approximate methods: Pollys Run, Duckpuddle Run, Lynchwood Lake, Stillwater Lake, Dotters Run, Hawkey Run, Pocono Summit Lake, Red Run, Clear Run, Tobyhanna Lake, Singer Run, Tobyhanna Creek, East Branch Dresser Run, Buck Hill Creek, Devils Hole Creek, Kistler Run, Hummler Run, Cross Keys Run, the Lehigh River, Rauscher Run, Taylor Creek, Fritz Run, Gouldsboro Lake, Pole Bridge Run, Wolf Run, Bradys Lake, Arrowhead Lake, Wallenpaupack Creek, Trout Creek, Blexley Run, Seventeenmile Creek, Jim Smith Run, Frame Cabin Run, Underwood Swamp, Tripup Run, Big Marsh, Selfice Swamp, Birch Swale, Bender Swamp, Yetter Swamp, Kistler Swamp, Pond Swamp, Oakes Swamp, Huckleberry Marsh, Octave Spring, and numerous unnamed swampy areas. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Township of Coolbaugh.

2.2 Community Description

The Township of Coolbaugh is located in northwestern Monroe County in northwestern Pennsylvania. It is bordered by the Townships of Lehigh (Wayne County), Dreher, and Greene to the north; the Townships of Barrett and Paradise, and the Borough of Mount Pocono to the east; the Township of Tobyhanna to the south; and the Townships of Lehigh (Lackawanna County) and Clifton to the west. The township covers an area of approximately 88 square miles and had a 1980 population of 3,993. The forecasted population for the year 1990 is 4,900.

The Township of Coolbaugh was incorporated in 1794. According to a 1976 Monroe County Land Use Summary, approximately 93 percent of the land in the township is still undeveloped. This is probably due to the fact that large portions of the township are designated State

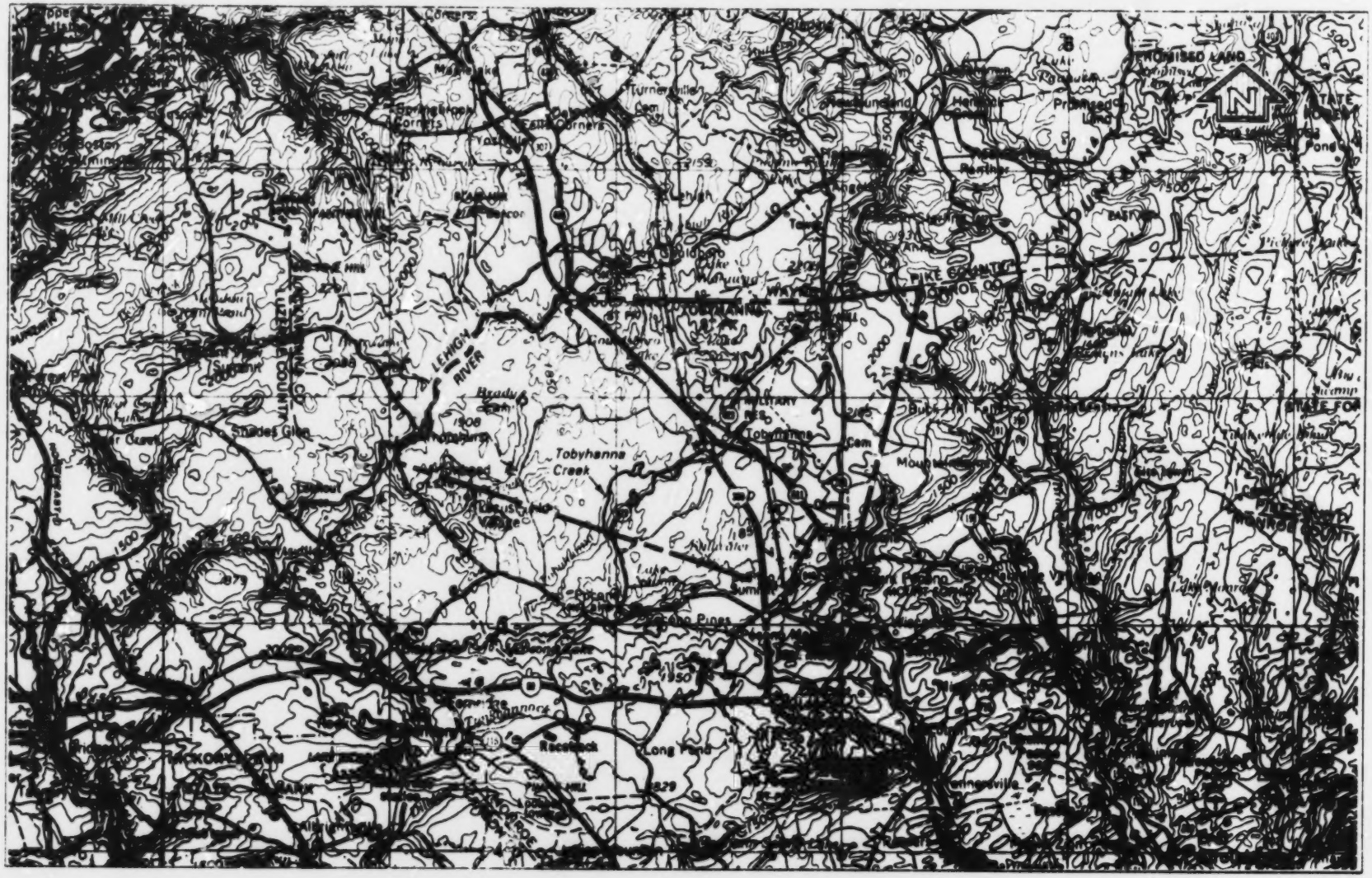

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF COOLBAUGH, PA

(MONROE CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Game Lands and State Parks. Presently, residential development is occurring in the eastern portion of the township.

Tobyhanna Creek flows in a southwestern direction through the community. In the central portion of the township, the stream meanders through gently rolling hills near the Village of Tobyhanna.

The climate in this geographic area is characterized by temperatures ranging from an average high of 68 degrees Fahrenheit (^{o}F) in summer and 30 ^{o}F in winter. The average annual rainfall for the region is 44 inches.

2.3 Principal Flood Problems

The principal flood problems in the Township of Coolbaugh are associated with Tobyhanna Creek near Tobyhanna. The floodplain in this area is relatively broad, and meanders in the stream are quite pronounced. A review of newspaper accounts reveals that very little information is available relative to past flood events in the township.

2.4 Flood Protection Measures

There are no local flood protection measures in the Township of Coolbaugh. Although there are several large lakes within the township, they appear to be primarily maintained for recreational purposes. Therefore, it is assumed that since the pool elevation is normally maintained at the spillway crest elevation, minimum flood peak moderation would be accomplished for a flood with a 100-year magnitude.

Residents of the township depend on the usual warnings issued through radio, television, and local newspapers for information concerning possible flood conditions. Flood warnings and predicted flood peaks are issued by the National Oceanic and Atmospheric Administration (NOAA) Flood Forecasting Centers located in Harrisburg, Pennsylvania, and Trenton, New Jersey.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a

specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

All USGS stream gages with a reasonable number of years of record in Monroe, Wayne, Pike, and nearby counties were analyzed. A flood frequency analysis to determine the 100-year event for Tobyhanna Creek was performed. This produced records of drainage areas and 100-year flood events that were plotted to generate a regional curve.

The peak discharges for the Lehigh River were obtained from the Flood Insurance Study for the Township of Lehigh in Lackawanna County (Reference 1).

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
TOBYHANNA CREEK		
At Interstate Route 380	18.1	2,550
Upstream of confluence of Pollys Run	16.8	2,375
Upstream of confluence of Mill Pond #1	15.4	2,180
Upstream of confluence of East Branch	9.9	1,415
LEHIGH RIVER		
Downstream of downstream corporate limits	75.4	19,230

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the Lehigh River were obtained from the Flood Insurance Study for the Township of Lehigh in Lackawanna County (Reference 1). Distances between cross sections on the Lehigh River may not agree with the floodway data table since the maps in this study used a different source than the Lehigh study.

Cross sections for the backwater analysis for the streams studied by detailed methods were photogrammetrically surveyed or field surveyed (Reference 2). Cross sections were located at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures. The ground control for the photogrammetry was acquired using inertial surveying techniques (Reference 3).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 4). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for Tobyhanna Creek were obtained from backwater computations of its respective main stream or from normal depth computations, as appropriate. Starting water-surface elevations for the Lehigh River were determined using the slope/area method. The results of the water-surface elevations for Tobyhanna Creek are tabulated for selected cross sections (Table 2).

Roughness factors (Manning's "n") used in the hydraulic computations were chosen on the basis of engineering judgment and field observations of the stream and floodplain areas (Reference 5). The channel "n" value for Tobyhanna Creek was 0.045, and the overbank "n" value was 0.090. The channel "n" value for the Lehigh River was 0.035, and the overbank "n" value was 0.100.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

FLOODING SOURCE		STREAM CHANNEL			LEFT OVERBANK			RIGHT OVERBANK			100 YEAR FLOOD WATER SURFACE ELEVATION
CROSS SECTION	DISTANCE (FT.)	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	
A	300	45	1830	7.1	185	570	1.8	25	150	2.2	1877.9
B	1925	40	1220	7.5	55	310	2.6	140	840	2.7	1891.9
C	2600	50	1470	6.7	240	480	1.7	165	420	2.0	1896.4
D	5125	120	1030	1.5	215	350	0.5	390	990	0.6	1901.6
E	8950	50	690	2.3	160	280	0.7	480	1210	0.8	1912.4
F	10475	80	1300	2.6	295	40	0.3	30	80	0.8	1913.0
G	12200	60	1120	8.2	35	100	2.6	140	200	2.5	1922.5

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

Township of Coolbaugh
Monroe County
Pennsylvania

REGULATORY DATA

Tobyhanna Creek

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All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 6).

For the flooding sources studied by approximate methods, the floodplain boundaries were delineated using the Flood Hazard Boundary Map for the Township of Coolbaugh and USGS topographic maps (References 7 and 6).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that

the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 3). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Lehigh River extend beyond the corporate limits. No floodways were calculated as part of this study; the floodway for the Lehigh River was taken from the Flood Insurance Study for the Township of Lehigh in Lackawanna County (Reference 1).

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						(FEET NGVD)		
Lehigh River								
A	0.25	413/73	3,624	4.4	1,514.3	1,514.3	1,515.3	1.0
B	0.45	406/94	4,723	3.4	1,515.9	1,515.9	1,516.9	1.0
C	0.74	650/398	6,827	2.4	1,517.2	1,517.2	1,518.2	1.0
D	1.15	467/63	3,866	4.0	1,518.6	1,518.6	1,519.5	0.9
E	1.41	122/62	1,527	10.0	1,520.4	1,520.4	1,521.4	1.0
F	1.78	100/60	1,413	10.8	1,527.3	1,527.3	1,528.0	0.7
G	1.98	70/35	798	19.2	1,532.5	1,532.5	1,532.9	0.4
H	2.32	212/92	1,466	10.4	1,543.8	1,543.8	1,544.0	0.2
I	2.59	210/102	1,552	9.9	1,550.1	1,550.1	1,550.1	0.0
J	2.75	212/162	2,134	7.2	1,552.3	1,552.3	1,552.9	0.6
K	2.92	206/86	2,352	6.5	1,553.6	1,553.6	1,554.3	0.7
L	3.15	448/318	3,695	3.7	1,555.9	1,555.9	1,556.8	0.9
M	3.44	500/460	2,819	4.8	1,557.8	1,557.8	1,558.8	1.0
N	3.75	840/597	6,892	2.9	1,559.8	1,559.8	1,560.7	0.9
O	3.81	680/570	4,751	2.8	1,559.9	1,559.9	1,560.7	0.8
P	4.25	446/376	3,734	3.6	1,562.9	1,562.9	1,563.8	0.9
Q	4.52	590/270	3,661	3.4	1,565.1	1,565.1	1,566.1	1.0
R	4.82	450/170	1,650	4.7	1,567.8	1,567.8	1,568.7	0.9
S	4.95	400/360	2,547	4.9	1,570.4	1,570.4	1,570.6	0.2

[1]Miles above confluence of Choke Creek
[2]Width/width within corporate limits

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF COOLBAUGH, PA

(MONROE CO.)

FLOODWAY DATA

LEHIGH RIVER

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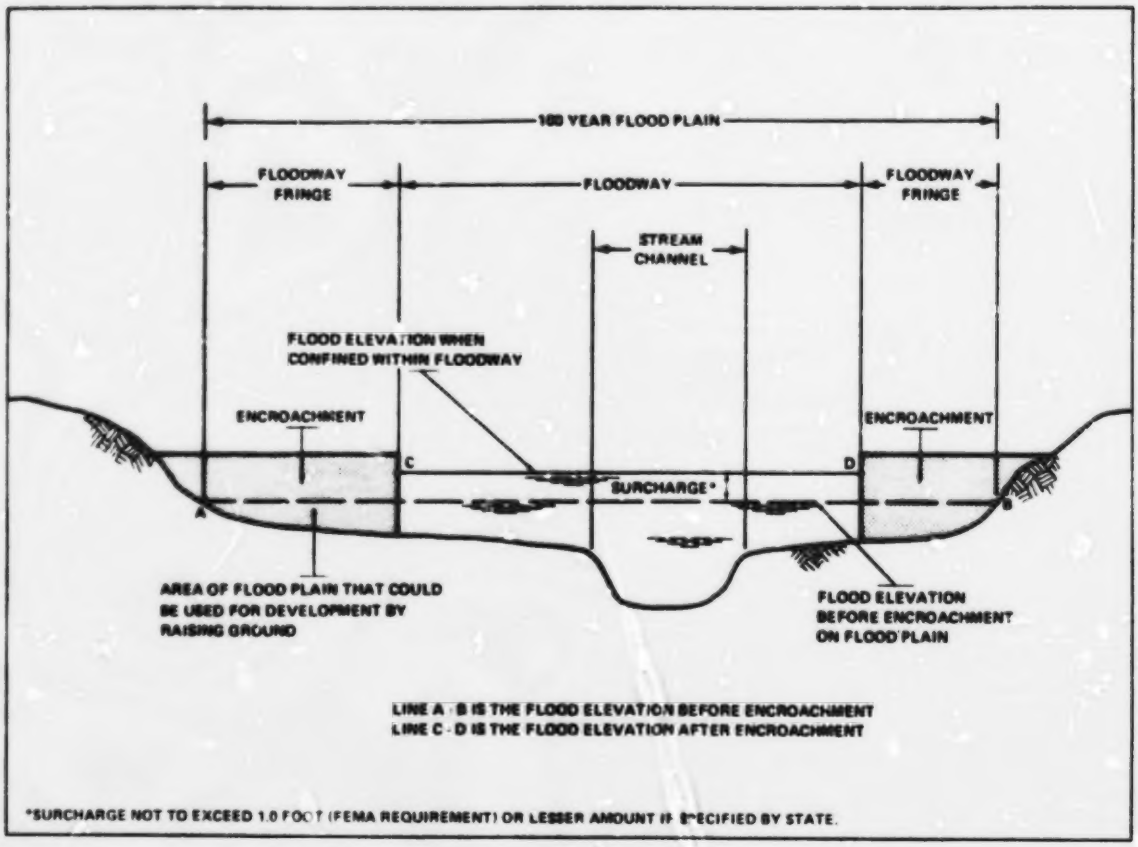
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

Flood Insurance Studies for the Township of Lehigh (Lackawanna County) and the Borough of Mt. Pocono have been published (Reference 1 and 8). The results of this study are in agreement with the results of those studies.

Flood Insurance Studies are currently being prepared for the Townships of Lehigh (Wayne County), Dreher, Tobyhanna, and Greene (References 9, 10, 11, and 12). The results of those studies will be in complete agreement with the results of this study.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Map for the Township of Coolbaugh (Reference 7).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

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3. Nortech (U. S. A.) Inc., Report on the Federal Emergency Management Agency Project, Inertial Elevation Survey for United States Army Corps of Engineers for Aerial Data Reduction Associates Inc., October/November 1985.

4. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Users Manual, Davis, California, 1982.

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7. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Coolbaugh, Monroe County, Pennsylvania, November 26, 1976.

8. Federal Emergency Management Agency, Flood Insurance Study, Borough of Mount Pocono, Monroe County, Pennsylvania, Washington, D. C., May 28, 1982.

9. Federal Emergency Management Agency, Flood Insurance Study, Township of Lehigh, Wayne County, Pennsylvania (Unpublished).

10. Federal Emergency Management Agency, Flood Insurance Study, Township of Dreher, Wayne County, Pennsylvania (Unpublished).

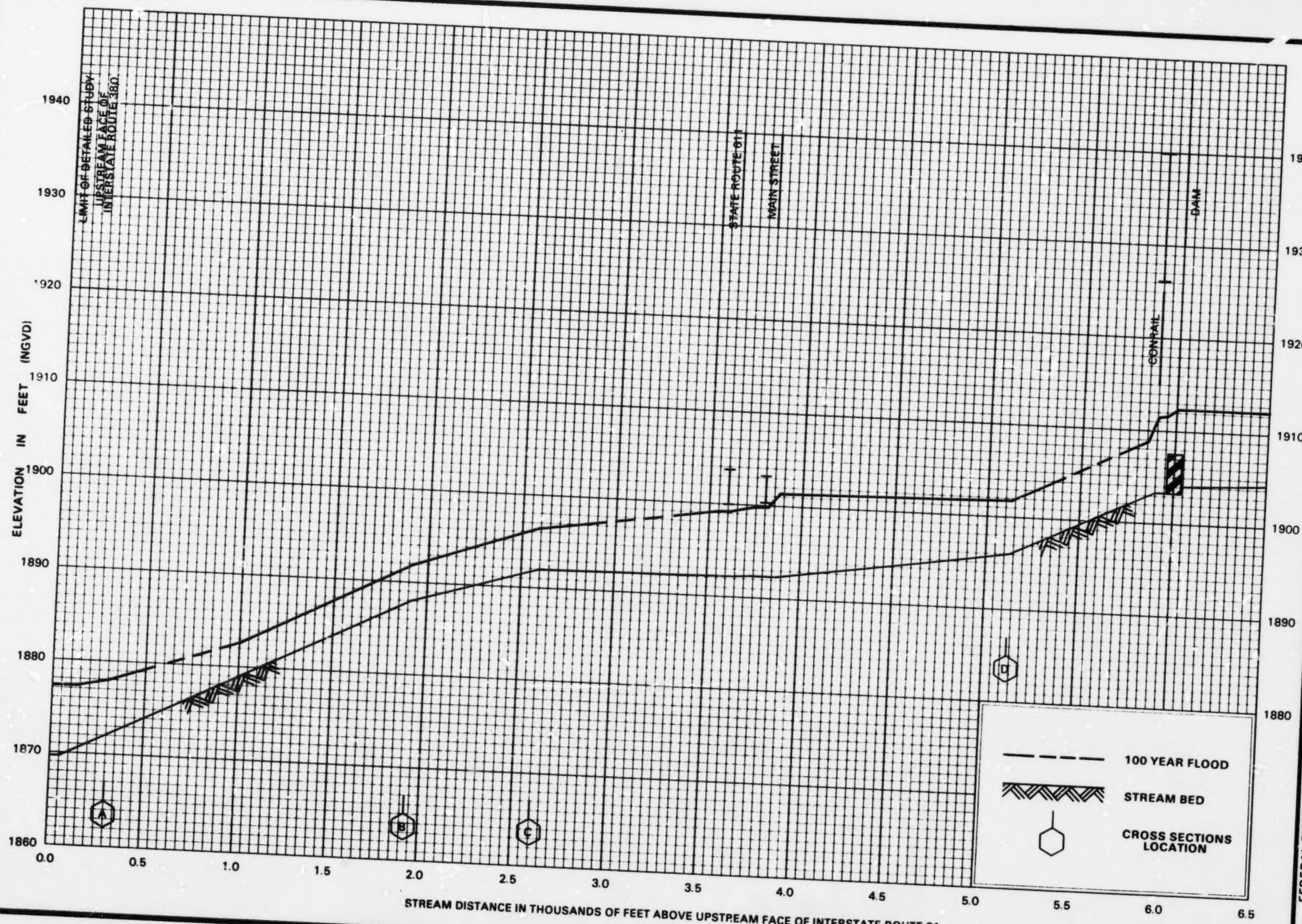
11. Federal Emergency Management Agency, Flood Insurance Study, Township of Tobyhanna, Monroe County, Pennsylvania (Unpublished).

12. Federal Emergency Management Agency, Flood Insurance Study, Township of Greene, Pike County, Pennsylvania (Unpublished).

Community Map, Traffic and Legislative Route Map, Monroe County, April 1984.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	35	1,896.95	Interstate Route 380 bridge over Tobyhanna Creek. PDH disk on east bound lane bridge of twin bridges, set in top of downstream bridge wall at northwest abutment.
RM 2	20	1,907.71	State Route 611 bridge over Tobyhanna Creek. Square cut at south corner of bridge in top parapet wall at abutment.
RM 3	20	1,905.43	Main Street bridge over Tobyhanna Creek. Square cut at west face of bridge in top wall over center pier.
RM 4	20	1,916.78	Leonard Lane bridge over Tobyhanna Creek. PK nail at south corner of bridge in top timber stringer on bridge wall at abutment.



FLOOD PROFILES

TOBYHANNA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF COOLBAUGH, PA
(MONROE CO.)

01P

ELEVATION IN FEET (NGVD)

1900 1910 1920 1930

6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE UPSTREAM FACE OF INTERSTATE ROUTE 81

LEONARD LANE

LIMIT OF DETAILED STUDY

E

F

G

100 YEAR FLOOD

STREAM BED

CROSS SECTIONS LOCATION

1900 1910 1920 1930

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF COOLBAUGH, PA

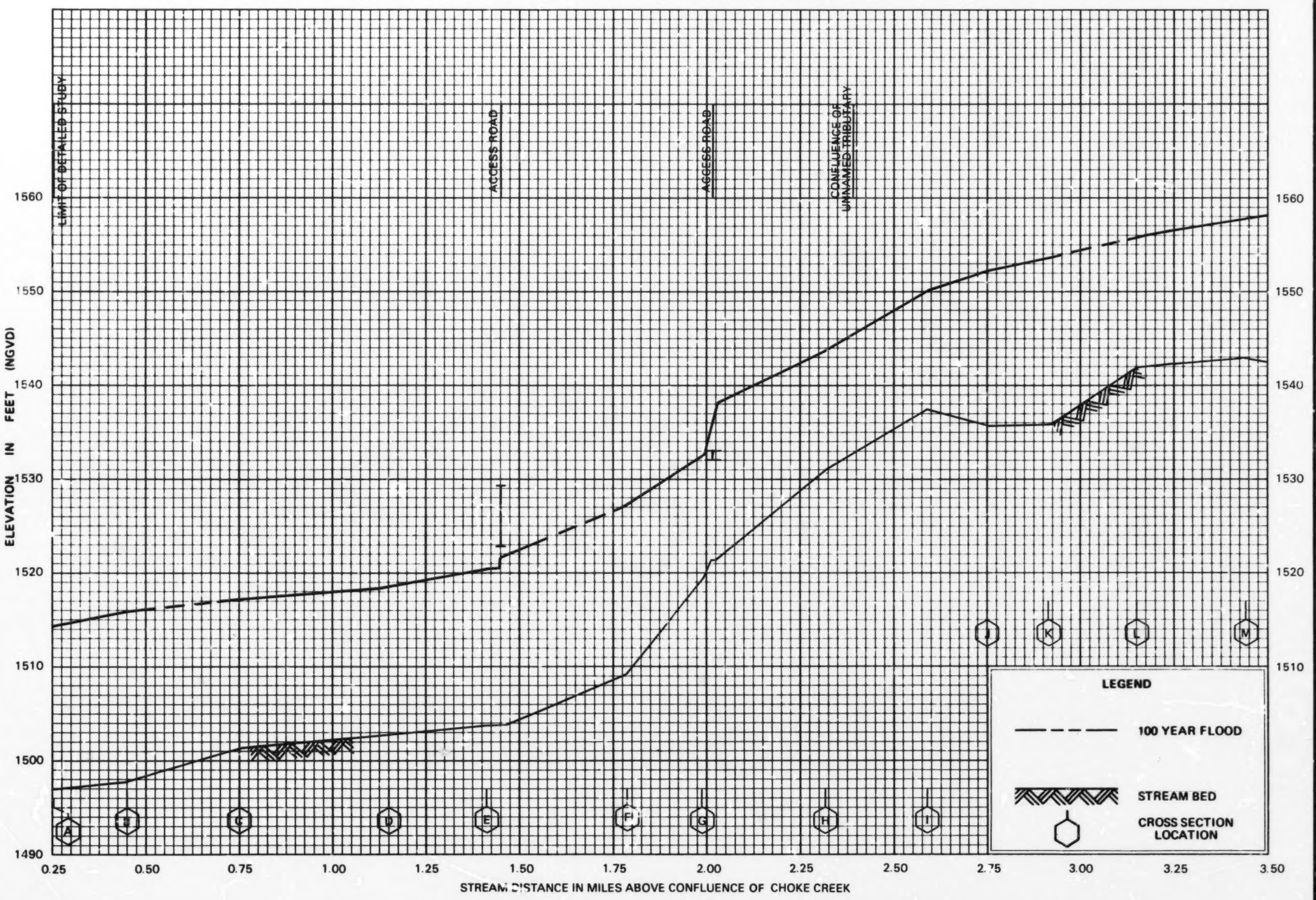
(MONROE CO.)

02P

FLOOD PROFILES

TOBYHANNA CREEK

17



FLOOD PROFILES

LEHIGH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF COOLBAUGH, PA

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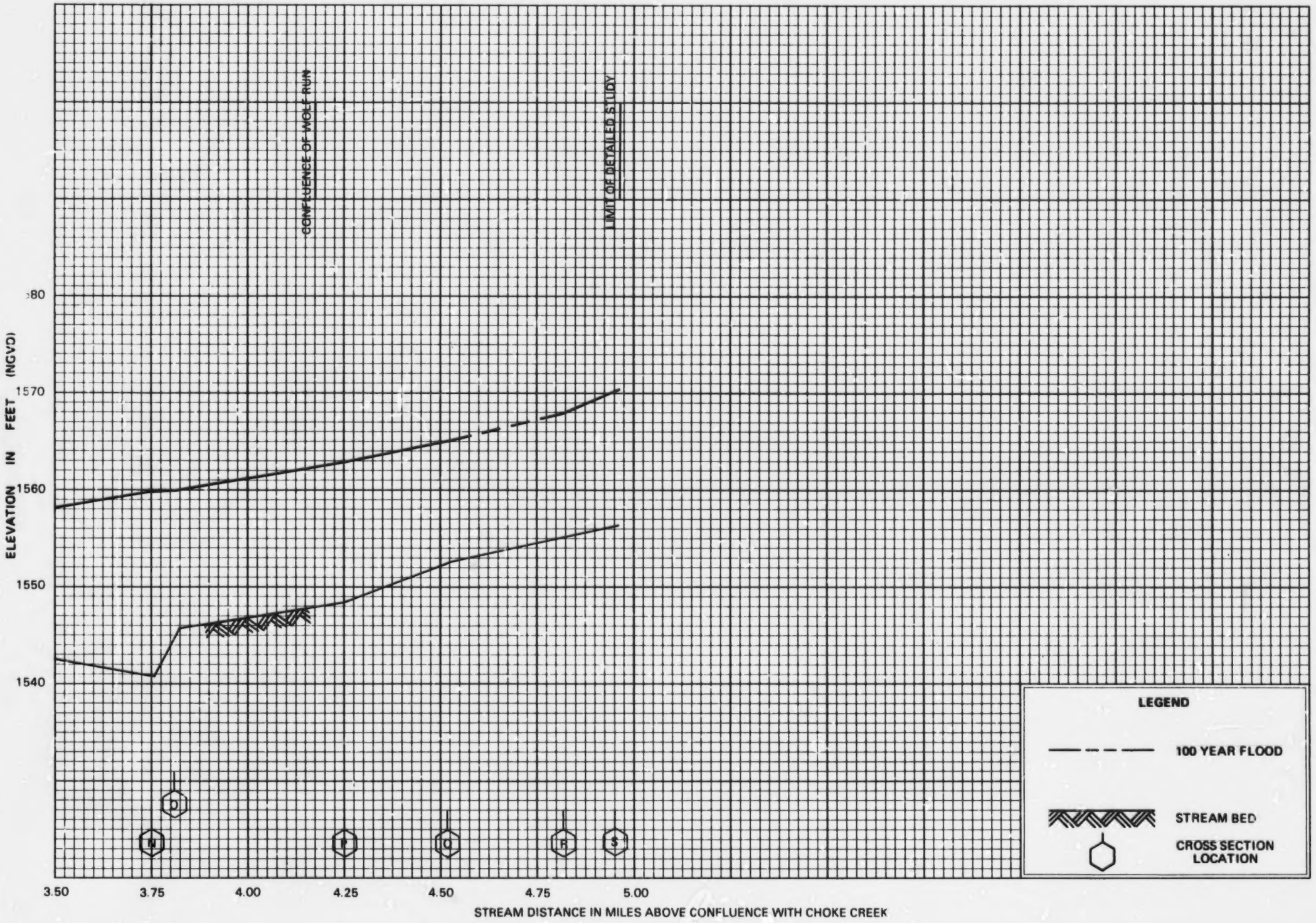
03P



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